

Novel Amalgams for In-Space Fabrication of Replacement Parts

Calvin Cochran, James R. Van Hoose and R.N. Grugel

Being able to fabricate replacement parts during extended space flight missions precludes the weight, storage volume, and speculation necessary to accommodate spares. Amalgams, widely used in dentistry, are potential candidates for fabricating parts in microgravity environments as they are moldable, do not require energy for melting, and do not pose fluid handling problems. Unfortunately, amalgams have poor tensile strength and the room temperature liquid component is mercury. To possibly resolve these issues a gallium-indium alloy was substituted for mercury and small steel fibers were mixed in with the commercial alloy powder. Subsequent microscopic examination of the novel amalgam revealed complete bonding of the components, and mechanical testing of comparable samples showed those containing steel fibers to have a significant improvement in strength. Experimental procedures, microstructures, and test results are presented and discussed in view of further improving properties.